In the Specification

Substitute paragraphs for the Specification are set forth below:

[0001] This application is related to United States patent application serial no. 10/699,481 ~~10/XXX,XXX~~ of John D. Larson III and Richard Ruby entitled *Thin-Film Acoustically-Coupled Transformer* ~~(Agilent Docket No. 10030993)~~, filed on the filing date of this application and incorporated into this application by reference.

[0009] The invention provides in a first aspect a band-pass filter characterized by a center frequency. The band-pass filter ~~that~~ has a stacked pair of film bulk acoustic resonators (FBARs) and an acoustic decoupler between the FBARs. Each of the FBARs has opposed planar electrodes and a layer of piezoelectric material between the electrodes. The acoustic decoupler has a single layer of acoustic decoupling material having a nominal thickness equal to an odd integral multiple of one quarter of the wavelength in the acoustic decoupling material of an acoustic wave having a frequency equal to the center frequency. The acoustic decoupler controls the coupling of acoustic energy between the FBARs. Specifically, the acoustic decoupler couples less acoustic energy between the FBARs than would be coupled by direct contact between the FBARs as in the exemplary SBAR shown in Figure 3. The reduced acoustic coupling gives the band-pass filter such desirable properties as a low insertion loss and flat frequency response in its pass band, a pass bandwidth in the range from about 3% to about 5% of the center frequency and good out-of-band rejection.

[0010] In one embodiment, the ~~acoustic decoupler includes a layer of~~ acoustic decoupling material ~~having~~ has an acoustic impedance less than that of the other materials of the FBARs. ~~In another embodiment, the acoustic decoupler includes a Bragg structure.~~

[0011] In another aspect, the invention provides a band-pass filter characterized by a center frequency. The band-pass filter has a stacked pair of film bulk acoustic resonators (FBARs) and a single layer of acoustic decoupling material between the FBARs. Each of the FBARs has opposed planar electrodes and a layer of piezoelectric material between the electrodes. The layer of acoustic decoupling material has a nominal thickness equal to an odd integral multiple of one quarter of the wavelength in the acoustic decoupling material of

an acoustic wave having a frequency equal to the center frequency. The acoustic decoupling material has an acoustic impedance less than the acoustic impedance of the piezoelectric material.

[0012] In another aspect, the invention provides an electrical filtering method. In the method, a pair of film bulk acoustic resonators (FBARs) is provided. An input electrical signal is applied to one of the FBARs. Acoustic energy is coupled between the FBARs by no more than one layer of acoustic decoupling material located between the FBARs. The acoustic energy coupled is less than would be coupled by direct contact between the FBARs. A filtered output electrical signal is output from the other of the FBARs.

[0013] ~~In a final aspect, the invention provides a method of fabricating an acoustically coupled device. In the method, a first film bulk acoustic resonator (FBAR) is fabricated and an acoustic decoupler is fabricated on the first FBAR. A second FBAR is fabricated on the acoustic decoupler. Fabricating the second FBAR on the acoustic decoupler involves subjecting the acoustic decoupler to a maximum temperature. Prior to fabricating the second FBAR, the first FBAR and the acoustic decoupler are baked at a temperature not lower than the maximum temperature. This ensures a reliable bond between the second FBAR and the acoustic decoupler.~~

[0014] Figure 1 is a schematic drawing of a band-pass filter incorporating FBARs.

Figure 2 is a schematic side view of an FBAR.

Figure 3 is a schematic side view of an SBAR.

Figure 4 is a graph comparing the calculated frequency response of the SBAR shown in Figure 3 and that of the FBAR-based band-pass filter shown in Figure 1.

Figure 5A is a plan view of an example of a first embodiment of a band-pass filter in accordance with the invention.

Figure 5B is a cross-sectional view of the band-pass filter shown in Figure 5A along the section line 5B-5B.

Figure 5C is an enlarged cross-sectional view of part of the band-pass filter shown in Figure 5A along the section line 5B-5B showing a first embodiment of the acoustic decoupler.

Figure 5D is an enlarged cross-sectional view of part of the band-pass filter shown in Figure 5A along the section line 5B-5B showing a second embodiment of the acoustic decoupler.

Figure 6 is a graph comparing the calculated frequency responses of embodiments of the band-pass filter in accordance with the invention incorporating acoustic decouplers of acoustic decoupling materials having different acoustic impedances.

Figures 7A-7J are plan views illustrating a process for making a band-pass filter in accordance with the invention.

Figures 7K- 7T ~~7S~~ are cross-sectional views along the section lines 7K-7K, 7L-7L, 7M-7M, 7N-7N, 7O-7O, 7P-7P, 7Q-7Q, 7R-7R, 7S-7S and 7T-7T in Figures 7A- 7J, respectively.

Figure 8 is a schematic drawing of an example of a second embodiment of a band-pass filter in accordance with the invention.

Figure 9 is a graph comparing the calculated frequency response of the embodiment of the band-pass filter shown in Figure 8 with the embodiment of the band-pass filter shown in Figures 5A and 5B.